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HANDBOOK ON SANITATION OF VESSEL WATERING POINTS. DESIGN AND OPERATION OF SANITATION FACILITIES FOR PIERS OR WHARVES WHERE VESSELS LOAD WATER

Public Health Service
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HANDBOOK ON SANITATION OF

Vessel Watering Points

DESIGN AND OPERATION
OF SANITATION FACILITIES
FOR PIERS OR WHARVES
WHERE VESSELS LOAD WATER

U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Public Health Service — Division of Sanitation

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FOREWORD

The health of the passengers and crew members aboard vessels can be protected against certain enteric diseases through the provision of safe water. Water for drinking and culinary purposes should be obtained from an approved source, should be delivered to the vessel in a sanitary manner, and should be so stored and distributed that it will not become contaminated.

This handbook is concerned with the protection of the water during the course of delivery from an approved source to the filling connections of the vessel's potable-water storage tank. The principles of sanitation set forth herein are intended to serve as guides for those who are charged with the design, construction, or operation of facilities on wharves and piers for loading potable water on vessels, and for the personnel of the Public Health Service and any State and local agencies concerned with the supervision of vessel watering points.

The basic Public Health Service authority is Public Law 410 of the Seventy-eighth Congress. Regulations prescribing sanitary standards for interstate carriers are found in the *Interstate Quarantine Regulations,* as revised March 3, 1951. Sections of these regulations which apply to the loading of potable water aboard vessels operating in interstate traffic have been included (see p. 1) for ready reference.

It should be mentioned at the outset that, although the standards set forth in this handbook do not have the legal force of the *Interstate Quarantine Regulations,* they were written so as to conform to the intent of those regulations. Compliance with these standards, therefore, will insure compliance with the *Interstate Quarantine Regulations.* Further, in case of noncompliance with a standard and failure to correct the reported condition, final corrective action will be based on the applicable regulation.

A brief description of the interrelationships of vessel companies, State health departments, and the Public Health Service, relative to methods of approving water supplies and watering points, will be found in the section entitled ADMINISTRATIVE PROCEDURES.

A copy of a Public Health Service form, *Report on Vessel Watering Point Sanitation,* is attached inside the back cover. Watering-point operators will find it helpful to have a copy of the handbook available when reviewing reports.

Undoubtedly, improved methods and equipment will be developed, which will lead to changes from the standards of today. These developments will be noted, and will be included in supplements to or revisions of the handbook, from time to time.

PERTINENT REGULATIONS

The sections of the *Interstate Quarantine Regulations* (as amended March 3, 1951) which pertain to the standards of sanitation set forth in this handbook are as follows:

Subpart D—Potable Water: Source and Use

72.101 *Water for drinking and culinary purposes; general requirement.* Only potable water shall be provided for drinking and culinary purposes by any operator of a conveyance engaged in interstate traffic, except as provided in 72.115 (b).[1] Such water shall either have been obtained from watering points approved by the Surgeon General, or, if treated aboard a conveyance, shall have been subjected to treatment approved by the Surgeon General.

72.102 *Approval of watering points.* (a) The Surgeon General shall approve any watering point if (1) the water supply thereat meets the standards prescribed in the *Drinking Water Standards* (see subpart J), and (2) the methods of and facilities for delivery of such water to the conveyance and the sanitary conditions surrounding such delivery prevent the introduction, transmission, or spread of communicable diseases.

(b) The Surgeon General may base his approval or disapproval of a watering point upon investigations made by representatives of State departments of health or of the health authorities of contiguous foreign nations.

(c) If a watering point has not been approved, the Surgeon General may permit its temporary use under such conditions as, in his judgment, are necessary to prevent the introduction, transmission, or spread of communicable diseases.

(d) Upon request of the Surgeon General, operators of conveyances shall provide information as to watering points used by them.

72.104 *Sanitation of water boats.* No vessel engaged in interstate traffic shall obtain water for drinking and culinary purposes from any water boat unless the tanks, piping, and other appurtenances used by the water boat in the loading, transportation, and delivery of such drinking and culinary water have been approved by the Surgeon General.

72.105 *Protection of pier water system.* No vessel engaged in interstate traffic shall make a connection between its nonpotable water system and any pier potable water system unless provisions are made to prevent backflow from the vessel to the pier.

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[1] 72.115 (b) reads as follows: In the case of existing vessels on which heat-treated wash-water has been used for the washing of utensils prior to the effective date of the regulations in this part, such water may continue to be so used, provided controls are employed to insure the heating of all water to at least 170° F. before discharge from the heater.

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CONSTRUCTION PLANS

In order that facilities for loading potable water aboard vessels may be constructed in conformance with the standards of sanitation set forth herein, plans for their construction or reconstruction should be submitted to the Public Health Service for review. The plans should show the location and size of distribution lines; location and types of any check valves or backflow preventers; location and types of water hydrants, including details of means for protecting the outlets of hydrants; storage facilities for hoses and other appurtenances; and similarly pertinent information. For water boats, detailed plans should show the filling lines, storage tanks and appurtenances, and pumping facilities.

All plans should be submitted, in duplicate, to the health department of the State in which the work will be done. After review, the State health department should send the plans, with its comments, to the appropriate Public Health Service Regional Engineer for formal approval. States should arrange to clear plans with local agencies, where required. Plan reports will be returned through the same channels. When a State health agency, or local agency, is unable to review plans, the plans should be sent directly to the appropriate Public Health Service Regional Engineer.

SOURCE OF WATER

The first consideration should be the quality of the water at its source. Water at the loading point is considered unsafe when it comes from a water supply which is not satisfactory.

Health authorities make inspections of all water supplies reported in use by vessel companies, and are able to determine whether or not the water is satisfactory. Inquiries regarding a water supply should be directed to the local health department, the State health agency, or the Public Health Service Regional Engineer.

WATERING FACILITIES [2]

1. *Water-Distribution System.* The lines in the water-distribution system should be of such size that adequate positive pressure can be maintained in all parts of the system. Systems which are considered capable of supplying sufficient pressure for fire-fighting purposes usually have more than ample pressure. In general, lines should be located above the normal water level in the harbor.

In order that hydrants may be repaired without shutting off large parts of the distribution system, it is suggested that valves be provided to permit each hydrant to be cut off separately from the supply line.

All necessary precautions should be taken to protect the potable water from contamination. There should be no connections between the potable-water system and any system carrying water of unknown or questionable quality. If such connections exist, they should be removed, unless the controlling agency considers the connection to be necessary, in which case a backflow-preventer device (subject to the agency's approval) may be used to protect the potable-water supply from backflow.

No plumbing should be installed which will permit the backflow of contaminated water, or other liquids, into the potable-water system. (For example, a potable-water connection should not be made, for priming purposes, with a pump which is used to deliver nonpotable water, as for fire fighting. Potable water should be delivered to such pumps only through an air gap.)

An air gap is an unobstructed vertical distance between the lowest opening from the supply pipe and the flow-level rim of the receiving receptacle. The minimum air gap should be at least twice the diameter of the effective opening.

When new facilities are installed, or when existing facilities are repaired, thereby exposing water to possible contamination, the new or repaired sections should be adequately disinfected before being placed in use.

2. *Protection Against Backflow from Vessel to Shore.* A connection will be made between the shore potable-water system and the fire-fighting system on board, probably, only when a vessel is without power to operate its own pumps. It is possible that such a connection, not protected by a backflow-preventer device on board, might remain after the vessel's power system will have become available. Then, in testing the ship's system, non-

[2] By *watering facilities* are meant all piping, hydrants, hoses, and other items necessary to deliver water from the water main which supplies the pier or wharf area to the vessel's water-storage tank-filling connection.

potable water from the ship's fire system may be pumped back through the hose into the shore's potable-water system. (Records are available which indicate that this has occurred many times.) The installation of a backflow-preventer device probably will prevent such occurrences.

A. *Protection on board ship.* Vessels which are constructed or reconstructed in accordance with Public Health Service standards must meet the following requirement:

> "When facilities are installed on a vessel whereby it will be possible to connect any nonpotable-water system on the vessel to a potable-water system on a pier for the purpose of utilizing the pressure from the pier system, there should be installed on the vessel, at or near the inlet end of the nonpotable system to be so implicated, a standard device to prevent flow of water from the vessel to the shore." [3]

If every vessel which obtains water from a particular watering point were equipped with a standard device (usually a single-check valve) to prevent flow of water from vessel to shore, there would be less need for additional protective devices ashore for this same purpose. It is conceivable that this situation does exist at some watering points, such as those which are used only by ships of one fleet, all of which are equipped with the backflow-preventer device. However, watering points which are used by ships under foreign flags, United States merchant ships built prior to the development of this vessel-construction standard, and other ships which do not comply with Public Health Service standards, should be protected by backflow-preventer devices ashore.

B. *Protection at pier.* A device should be installed in the line leading to each hydrant outlet to prevent back-pumpage. When the State or local controlling agency has regulations which are applicable, they should be followed. In the absence of such State or local regulations, at least a single-check valve should be installed.

Single-check valves do not provide the degree of protection afforded by double-check valves, differential (reduced zone) pressure backflow preventers, or complete separation, but are less expensive and easier to install. Back-pumpage against a check valve will probably result in the bursting of the hose.

Backflow preventers must be installed properly in order for them to function effectively and to permit inspection. In areas where freezing temperatures are encountered, they should be so installed as to permit drainage. They should be routinely inspected, and should be maintained in proper working condition.

3. *Hydrants.* Hydrants, including taps and faucets, should be designed, located, installed, and maintained in such a manner as to insure protection of the potable water from contamination.

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[3] From *Principles of Sanitation Applicable to the Construction of New Vessels*, now being revised under the title, *Handbook on Sanitation of Vessel Construction.*

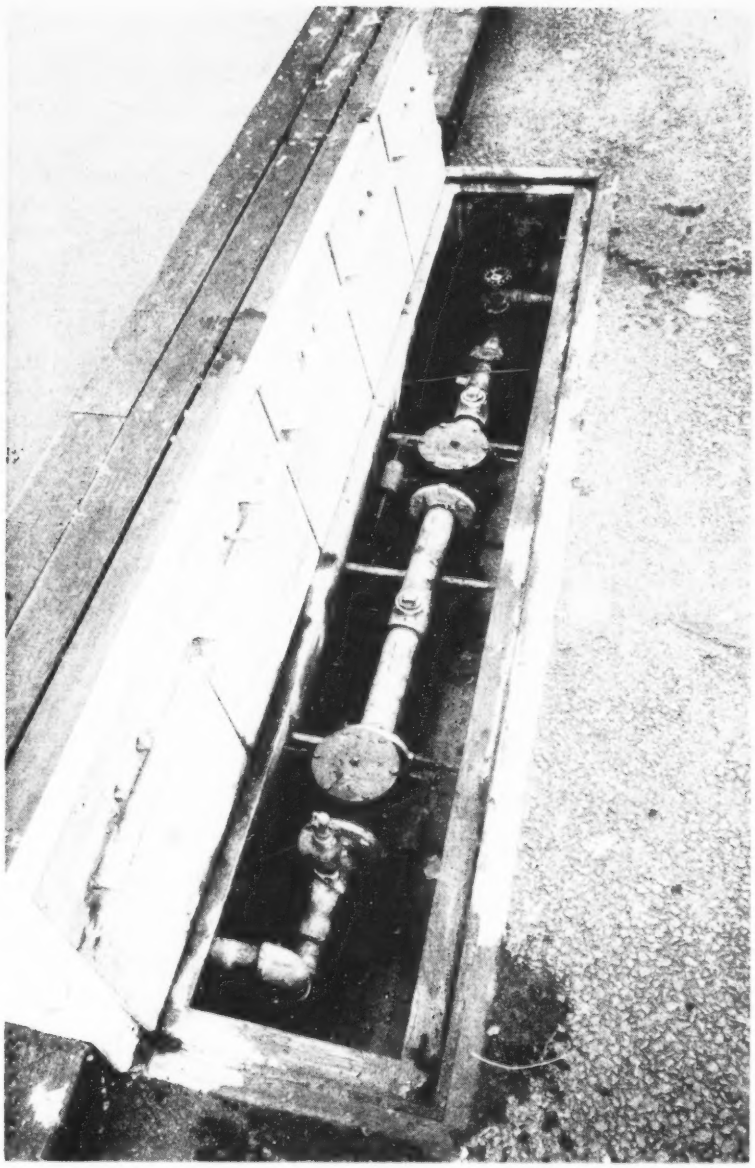

FIGURE 1. Backflow-preventer device (double-check valve) in the line leading to hydrant.

FIGURE 2. Portable backflow-preventer device (differential reduced zone pressure type) with meter.

In order to minimize as much as possible the opportunities for contamination, the following conditions should be observed:

(a) The hydrants, unless provided with adequate covers, should be so located that they will not be exposed to discharge from a vessel's waste lines or scuppers.

(b) The hydrants should not be located in toilet rooms, washrooms, or other places where significant danger of contamination exists.

(c) Hydrant supply lines and outlets should be so constructed and located that neither normal high water nor tidal action will result in submergence of any part of the line.

(d) All hydrants, unless protected by a housing or cover, should have their outlets terminating at least 18 inches above the surrounding platform or pier surface. The outlets should terminate in a downward or horizontal direction, and should be provided with caps and keeper chains.

(e) Drainage lines, if any, from the supply lines or hydrants, should terminate above the normal high-water level, and/or above the surge of water caused by incoming vessels.

(f) In cases of hydrant outlets less than 18 inches above the pier, the following items are considered necessary to protect the water from contamination:

Housings or covers should be used to protect the hydrant outlets against contamination. (*Housing* means a durable enclosure which may be open on the bottom.) They should be constructed of durable material, and should be watertight. When hydrant boxes are used, drainage from the boxes should discharge to the water surface beneath or alongside the pier, or to the ground surface. Drains should be pro-

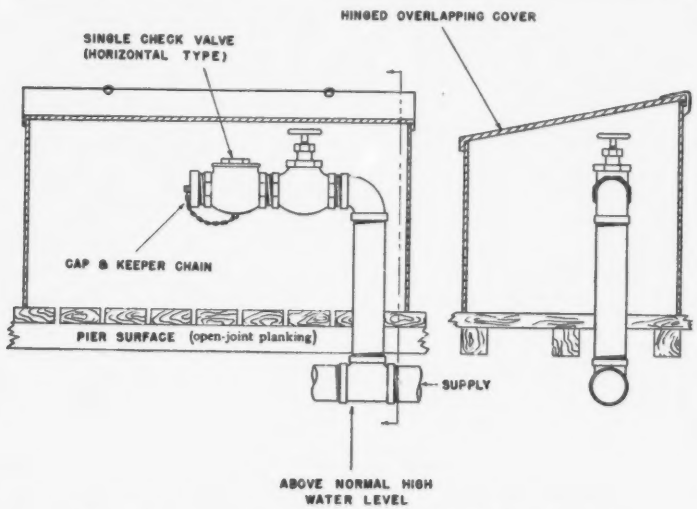

FIGURE 3. Example of a satisfactory installation of a hydrant.

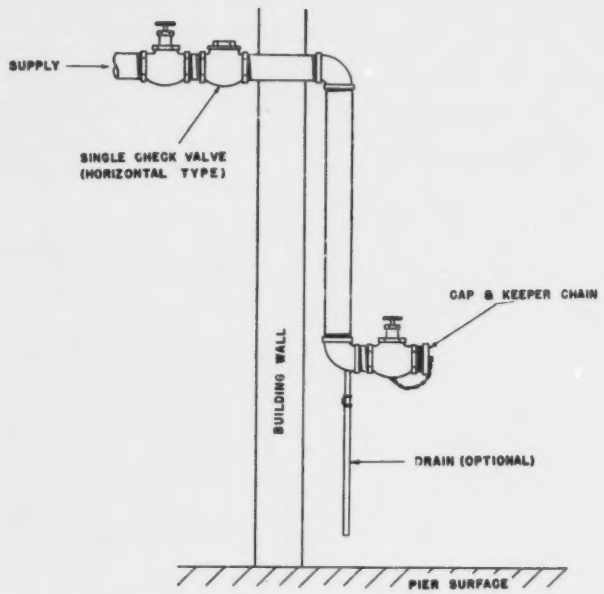

FIGURE 4. Example of a satisfactory installation of a hydrant.

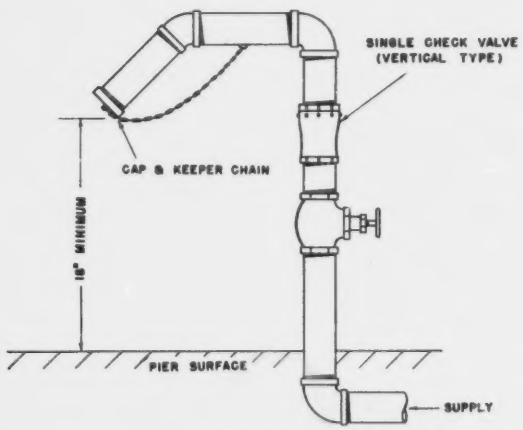

FIGURE 5. Example of a satisfactory installation of a hydrant.

vided which are of sufficient size to carry away all excess water. Drain pipes should not be connected to sanitary or storm sewers, except through an air gap.[4]

In addition, each hydrant box should be provided with overflow openings in its side. These openings should be not less than 2 inches in diameter, and should be so located as to permit a *spill line* 1 inch or more below all portions of the outlet. (Where adequate drainage is provided, overflow openings will not be required.) Outlets should be provided with caps and keeper chains, unless they are protected by self-closing covers.

Nonpotable-water hydrants should not be located on the same pier with potable-water hydrants, unless this should be absolutely necessary. When such installations are necessary, the potable-water hydrants should be clearly marked with signs reading POTABLE WATER, and the nonpotable-water hydrants should bear signs reading UNFIT FOR DRINKING. The hydrants for potable and nonpotable water should be of different colors, for further aid to their proper identification.

Where compressed air is utilized for blowing the water out of lines and hydrants for drainage purposes, a filter, liquid trap, or equivalent device should be installed in the supply line from the main compressed-air system, to prevent contamination of the lines and hydrants.

4. *Watering Hoses.* Watering hoses which are used for delivering potable water should be so constructed, maintained, and handled as to assure protection of the potable water against contamination.

The hose line should be of durable construction, and should have a smooth lining. Hose lines should be handled and maintained at all times in accordance with the following conditions:

(a) The potable-water hose line should be used *only* for the delivery of potable water.

(b) Before moving the hose, the ends should be capped. While moving the hose, care should be taken to prevent the ends from dragging on the ground and from falling into the harbor water.

(c) If the hose should drop into harbor water, or if the hose outlet or interior should become contaminated in any other way, all contaminated areas should be flushed thoroughly and disinfected before using the hose to convey water. A suggested method of disinfection is as follows:

(1) Flush hose thoroughly by allowing potable water to flow through it.

(2) Drain hose.

(3) Elevate ends of the hose to the same level.

(4) Fill hose to overflowing with chlorine solution having a strength of at least 100 parts per million, and allow to stand for 1 hour. (Shorter periods will require greater concentrations of chlorine solution.)

(5) Drain chlorine solution from hose.

[4] For requirements on air gaps, see p. 4.

(6) Flush hose thoroughly with potable water. Hose is now ready to use.

Table 1 shows how much disinfecting agent is required to make up various quantities of 100-p. p. m. chlorine solution.

TABLE 1

Solution (gallons)	Amount of chlorine compound required for 100-p. p. m. solution		
	Chlorinated lime 25 percent (ounces)	High test calcium hypochlorite 70 percent (ounces)	Liquid sodium hypochlorite 1 percent (quarts)
5	0.3	0.1	0.2
10	.6	.2	.4
15	.9	.3	.6
20	1.2	.4	.8
30	1.8	.6	1.2
50	3	1	2
100	6	2	4

NOTE.—2½-inch hose: capacity=0.256 gallons per lineal foot.

(d) After the hose is attached to the hydrant, it should be flushed before the other end is attached to the filling connection on the vessel.

(e) The hose line should be drained after each use, and should be placed on reels, or on racks or shelves in special lockers. When the hose is not stowed in a closed cabinet, the ends should be plugged or capped. The locker and reels should be clearly identified with permanent signs reading POTABLE WATER HOSE ONLY.

(f) The hose and fittings should be maintained in good repair.

5. *Appurtenances.* All fittings, meters, and other appurtenances used in loading potable water aboard vessels should be handled and stored in such a manner as to prevent them from becoming contaminated. Inlets and outlets of portable meters should be capped when not in use. These appurtenances should not be used for loading anything but potable water.

6. *Water Boats.*[5] Water boats should be so constructed and operated that the water will not become contaminated during the filling process, storage, and delivery of the water to other vessels. In determining the acceptability of the construction and operation of a water boat, the standards set forth in the sections on potable water in either of the following Public Health Service publications should apply:

(a) *Handbook on Sanitation of Vessel Construction.*[6]

(b) *Handbook on Sanitation of Vessels in Operation.*

[5] Water boats are boats or barges which carry potable water for loading into other boats or vessels.

[6] See footnote 3 p. 5.

ADMINISTRATIVE PROCEDURES

The procedure usually followed in the inspection and classification of water supplies and watering points is as follows:

(1) Periodically, the vessel companies are circularized by the Regional Engineers of the Public Health Service for information relative to their vessels' ports of call.

(2) Inspections of water supplies serving vessel watering points are made generally by representatives of the State health departments. Sanitary defects in a water supply are discussed with the water-purveyor representative, and suggestions are given for correction. The State health departments regularly submit reports on the water supplies to the appropriate Public Health Service Regional Engineer.

(3) Inspections of the watering points are made either by Public Health Service regional personnel or by State health department representatives. Watering points serving passenger vessels are inspected at least once each year, and those serving freight vessels at least once every 3 years.

(4) The Regional Engineer reviews the reports of the State health department and, after concurrence, determines the classification of the watering point. The classification falls into one of three categories—"Approved," "Provisionally approved," or "USE PROHIBITED."

(5) When the classification of a watering point within a port of call is "USE PROHIBITED," all vessel companies using this port of call are notified immediately by the Regional Engineer to cease obtaining water from the point in question. When the classification is "Provisionally approved," a time limit is placed on the use of that point during which necessary corrections must be made to prevent the point from being classified "USE PROHIBITED."

(6) Periodically, the Regional Engineer submits to the Division of Sanitation, Public Health Service, the classification of each watering point in each port of call. These are then included in the periodic *Official Classification List of Vessel Watering Points.*

(7) The *Official Classification List* is distributed by the Regional Engineers to all vessel companies which have reported the use of any ports of call.

FEDERAL SECURITY AGENCY
PUBLIC HEALTH SERVICE

REPORT ON VESSEL WATERING POINT SANITATION
(Exclusive of Water Supply)

CITY	STATE	DATE OF INSPECTION
PIER	LOCATION OF PIER	SOURCE OF WATER SUPPLY
SUPERINTENDENT OF PIER	LOCAL REPRESENTATIVE CONFERRED WITH	

CLASSIFICATION RECOMMENDED *(Check one)*

☐ APPROVED ☐ PROVISIONAL *(Expiration Date* _____ *)* ☐ PROHIBITED

REPORT PREPARED BY *(Name and Title)*	AGENCY

DEFECTS INDICATED BY "X"

1. DISTRIBUTION SYSTEM AT POINT		3. HYDRANTS (Con't.)	
Adequate water pressure		Potable and non-potable hydrants on same pier properly identified	
No connection between potable water system and other system of lower quality		Air lines have adequate filters	
Cut-off valve in line to each hydrant		**4. WATER HOSES** *(If on dock)*	
Supply lines above normal high water		Acceptable material and condition	
2. PROTECTION AGAINST BACKFLOW FROM VESSELS		used only for potable water	
Adequate backflow prevention device		Ends not dragged	
In line to each hydrant outlet		Openings protected when not used	
Installed properly		Flushed before being used	
Inspected periodically		Disinfected before using after contamination	
3. HYDRANTS		Properly stored	
Not located in toilets or similar places		**5. APPURTENANCES**	
Outlets not exposed to vessel waste discharges		Properly stored	
Outlets directed downward or horizontal		Inlets and outlets capped when not in use	
Outlets less than 18" above pier properly housed		Used only for loading potable water	
Outlets provided with caps and keeper chains			
Ground level hydrant boxes adequately drained			
No connections of drains to sewers			
Overflow protected against flooding			

SKETCHES AND REMARKS:

(Continued on reverse side)

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